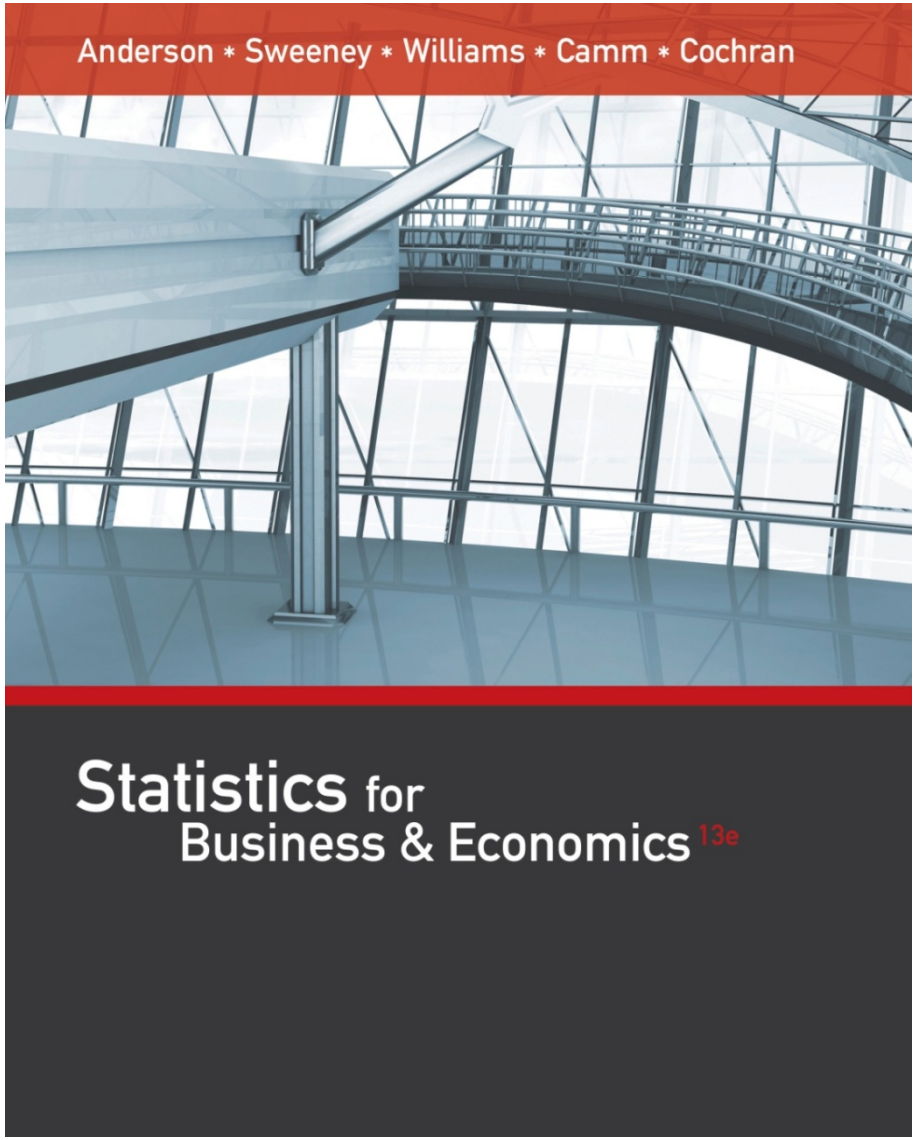
Statistics for Business and Economics (13e)

Anderson, Sweeney, Williams, Camm, Cochran

Slides by John Loucks

St. Edwards University



Chapter 1 - Data and Statistics

- Statistics
- Applications in Business and Economics
- Data
- Descriptive Statistics
- Statistical Inference

What is Statistics?

- The term statistics can refer to *numerical facts* such as averages, medians, percentages, and maximums that help us understand a variety of business and economic situations.
- Statistics can also refer to the *art and science* of collecting, analyzing, presenting, and interpreting data.

Applications in Business and Economics

Accounting

- Public accounting firms use statistical sampling procedures when conducting audits for their clients.

Economics

- Economists use statistical information in making forecasts about the future of the economy or some aspect of it.

Finance

- Financial advisors use price-earnings ratios and dividend yields to guide their investment advice.

Applications in Business and Economics

Marketing

- Electronic point-of-sale scanners at retail checkout counters are used to collect data for a variety of marketing research applications.

Production

- A variety of statistical quality control charts are used to monitor the output of a production process.

Information Systems

- A variety of statistical information helps administrators assess the performance of computer networks.

Data and Data Sets

- Data are the facts and figures collected, analyzed, and summarized for presentation and interpretation.
- All the data collected in a particular study are referred to as the data set for the study.

Elements, Variables, and Observations

- Elements are the entities on which data are collected.
- A variable is a characteristic of interest for the elements.
- The set of measurements obtained for a particular element is called an observation.
- A data set with *n* elements contains *n* observations.
- The total number of data values in a complete data set is the number of elements multiplied by the number of variables.

Data, Data Sets, Elements, Variables, and Observations

Variables

Company	Stock Exchange	Annual Sales ($M)	Earnings per share ($)
Dataram	NQ	73.10	0.86
EnergySouth	N	74.00	1.67
Keystone	N	365.70	0.86
LandCare	NQ	111.40	0.33
Psychemedics	N	17.60	0.13

Element Names

Observation

Data Set

Scales of Measurement

- Scales of measurement include
  - Nominal
  - Ordinal
  - Interval
  - Ratio
- The scale determines the amount of information contained in the data.
- The scale indicates the data summarization and statistical analyses that are most appropriate.

Scales of Measurement

Nominal scale

- Data are labels or names used to identify an attribute of the element.
- A nonnumeric label or numeric code may be used.

Example

Students of a university are classified by the school in which they are enrolled using a nonnumeric label such as Business, Humanities, Education, and so on.

Alternatively, a numeric code could be used for the school variable (e.g. 1 denotes Business, 2 denotes Humanities, 3 denotes Education, and so on).

Scales of Measurement

Ordinal scale

- The data have the properties of nominal data and the order or rank of the data is meaningful.
- A nonnumeric label or numeric code may be used.

Example

Students of a university are classified by their class standing using a nonnumeric label such as Freshman, Sophomore, Junior, or Senior.

Alternatively, a numeric code could be used for the class standing variable (e.g. 1 denotes Freshman, 2 denotes Sophomore, and so on).

Scales of Measurement

Interval scale

- The data have the properties of ordinal data, and the interval between observations is expressed in terms of a fixed unit of measure.
- Interval data are always numeric.

Example

Melissa has an SAT score of 1985, while Kevin has an SAT score of 1880. Melissa scored 105 points more than Kevin.

Scales of Measurement

Ratio scale

- Data have all the properties of interval data and the ratio of two values is meaningful.
- Ratio data are always numerical.
- Zero value is included in the scale.

Example:

Price of a book at a retail store is $ 200, while the price of the same book sold online is $100. The ratio property shows that retail stores charge twice the online price.

Categorical and Quantitative Data

- Data can be further classified as being categorical or quantitative.
- The statistical analysis that is appropriate depends on whether the data for the variable are categorical or quantitative.
- In general, there are more alternatives for statistical analysis when the data are quantitative.

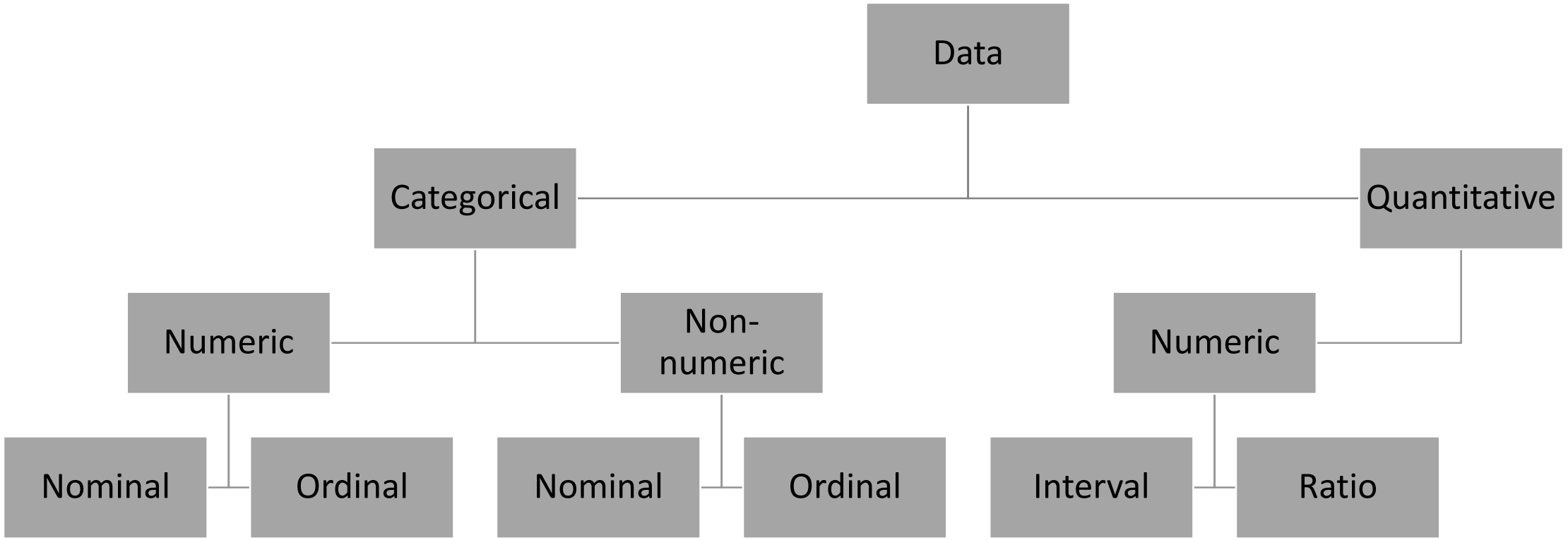
Categorical Data

- Labels or names are used to identify an attribute of each element
- Often referred to as qualitative data
- Use either the nominal or ordinal scale of measurement
- Can be either numeric or nonnumeric
- Appropriate statistical analyses are rather limited

Quantitative Data

- Quantitative data indicate how many or how much.
- Quantitative data are always numeric.
- Ordinary arithmetic operations are meaningful for quantitative data.

Scales of Measurement



Descriptive Statistics

- Most of the statistical information in newspapers, magazines, company reports, and other publications consists of data that are summarized and presented in a form that is easy to understand.
- Such summaries of data, which may be tabular, graphical, or numerical, are referred to as descriptive statistics.

Example

The manager of Hudson Auto would like to have a better understanding of the cost of parts used in the engine tune-ups performed in her shop. She examines 50 customer invoices for tune-ups. The costs of parts, rounded to the nearest dollar, are listed on the next slide.

Example: Hudson Auto Repair

Sample of Parts Cost ($) for 50 Tune-ups

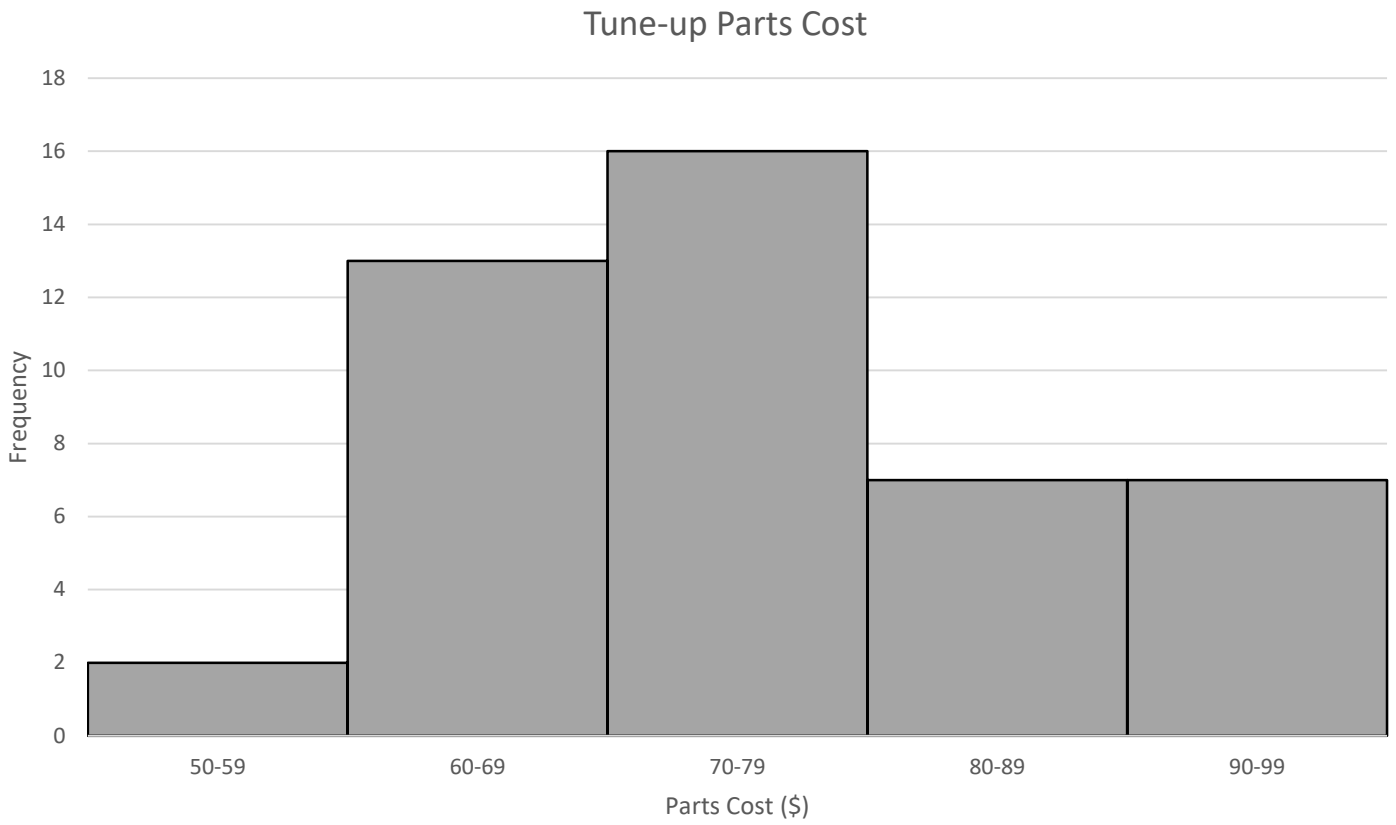
91	78	93	57	75	52	99	80	97	62
71	69	72	89	66	75	79	75	72	76
104	74	62	68	97	105	77	65	80	109
85	97	88	68	83	68	71	69	67	74
62	82	98	101	79	105	79	69	62	73

Tabular Summary: Frequency and Percent Frequency

Parts Cost ($)	Frequency	Percent Frequency
50-59	2	4%
60-69	13	26%
70-79	16	32%
80-89	7	14%
90-99	7	14%
100-109	5	10%
TOTAL	**50**	**100%**

Graphical Summary: Histogram

Example: Hudson Auto



Numerical Descriptive Statistics

- The most common numerical descriptive statistic is the mean (or average).
- The mean demonstrates a measure of the central tendency, or central location of the data for a variable.
- Hudson's mean cost of parts, based on the 50 tune-ups studied is $79 (found by summing up the 50 cost values and then dividing by 50).

Statistical Inference

Population: The set of all elements of interest in a particular study.

Sample: A subset of the population.

Statistical inference: The process of using data obtained from a sample to make estimates and test hypotheses about the characteristics of a population.

Census: Collecting data for the entire population.

Sample survey: Collecting data for a sample.

Process of Statistical Inference

Example: Hudson Auto

Step 1
- Population consists of all tune ups. Average cost of parts is unknown.

Step 2
- A sample of 50 engine tune-ups is examined.

Step 3
- The sample data provides a sample average parts cost of $79 per tune-up.

Step 4
- The sample average is used to estimate the population average.

End of Chapter 1